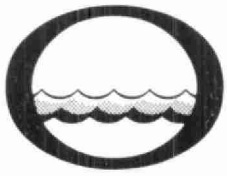
1970 OPERATING SUMMARY

KINGSTON

water pollution control plant

ONTARIO WATER RESOURCES COMMISSION

Division of Plant Operations



Water management in Ontario

Ontario
Water Resources
Commission

135 St. Clair Ave. W.
Toronto 195
Ontario

Once again we have the privilege of submitting to you our latest detailed report on financial progress and technical activity at your water pollution control plant.

The statistical information contained in this annual operating summary will undoubtedly be a useful barometer of efficiency. Of particular interest will be the comments and recommendations of the regional operations engineer, who was intimately connected with day-to-day operation throughout 1970.

Together with the extensive cost data provided, this information should assist greatly in your general understanding of the problems met and dealt with, and in furnishing a yardstick for possible future expansion.

D. S. Caverly,
General Manager.

D. A. McTavish, P. Eng.,
Director,
Division of Plant Operations.

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KINGSTON

water pollution control plant

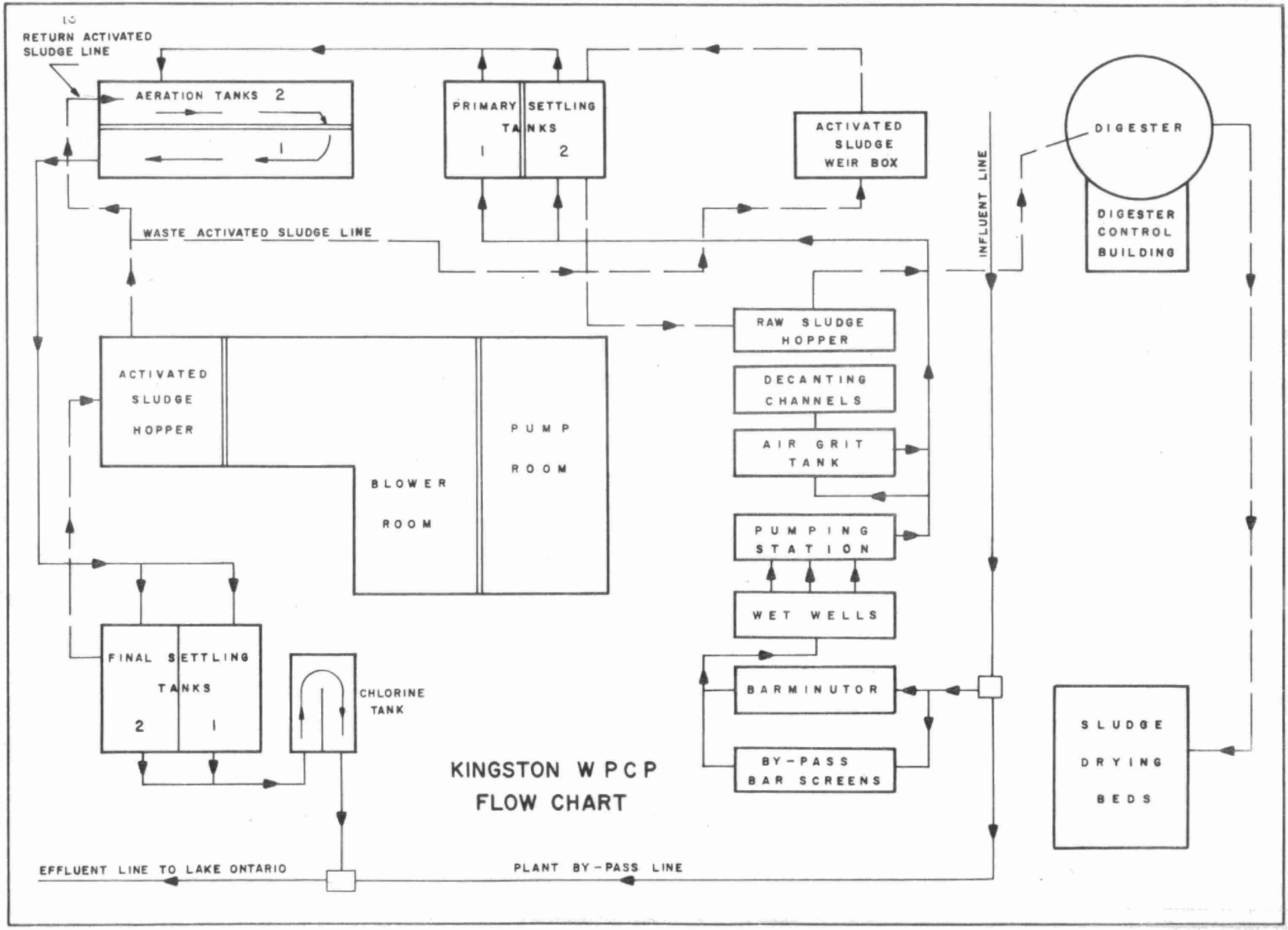
operated for

THE TOWNSHIP OF KINGSTON

by the

ONTARIO WATER RESOURCES COMMISSION

1970 ANNUAL OPERATING SUMMARY


RETURN ACTIVATED SLUDGE LINE
AERATION TANKS 2
1
PRIMARY SETTLING TANKS
1
2
ACTIVATED SLUDGE WEIR BOX
INFLUENT LINE
DIGESTER
DIGESTER CONTROL BUILDING
WASTE ACTIVATED SLUDGE LINE
RAW SLUDGE HOPPER
DECANTING CHANNELS
AIR GRIT TANK
ACTIVATED SLUDGE HOPPER
BLOWER ROOM
PUMP ROOM
PUMPING STATION
WET WELLS
BARMINUTOR
BY-PASS BAR SCREENS
FINAL SETTLING TANKS
2
1
CHLORINE TANK
SLUDGE DRYING BEDS
KINGSTON W P C P
FLOW CHART
EFFLUENT LINE TO LAKE ONTARIO
PLANT BY-PASS LINE

DESIGN DATA

PROJECT NO.	2-0098-61	TREATMENT	Activated Sludge
DESIGN FLOW	0.83 mgd	DESIGN POPULATION	10,000
BOD - Raw Sewage	210 mg/l	SS - Raw Sewage	250 mg/l

PRIMARY TREATMENT

Comminution

Type: C.P. Barminutor
Size: One Model C (18")

Sewage Lift Pumps

Type: Weinman Type VBM
Size: Two 1200 gpm @ 35' tdh

Grit Removal

Type: Aerated; grit removed by air lift
Size: 1920 gal
Retention: 2 min

Primary Sedimentation

Type: Falk
Size: Two 46' x 12' x 7' 7" deep (8,380 cu ft or 52,200 gal)
Retention: 1.5 hours
Loading: Surface, 750 gal/ft^2/day
Weir, 8,600 gal/ft/day

SECONDARY TREATMENT

Aeration Tanks

Type: Diffused air; Two-pass
Size: One tank 62' x 22.5' x 15' (each pass) (41,900 cu ft or 262,000 gal)
Retention: 7.6 hours

Air Supply

Type: Roots-Connersville
Size: Two 880 scfm

Diffusers

Type: C.P. Discfuser
Spacing: 63 diffusers per pass (wide band)

Secondary Sedimentation

Type: Falk
Size: Two 56' x 12' x 9' deep (12,100 cu ft or 75,600 gal)
Retention: 2.2 hours
Loading: Surface, 562 gal/ft^2/day
Weir, 5,050 gal/ft/day

CHLORINATION

- One W & T (100 lb/day)

Chlorine Contact Chamber

Size: One 27' 8" x 9' x 8' deep (10,300 gal)
Retention: 18 min

OUTFALL

- 3,000 ft to Lake Ontario

SLUDGE HANDLING

Digestion System

Type: Single stage, mixed by sludge recirculation
Size: One 55' dia x 20' swd (54,500 cu ft or 340,000 gal)
Loading: 0.57 lb/cu ft/mo
Recirculation pump - One Weinman: 150 gpm @ 65'

Sludge Drying Beds

- Four 80' x 20' (6,400 sq ft)

'70 REVIEW

FLOWS	DAILY FLOW mil gal	OCCURRING IN THE MONTH OF	MONTHLY FLOW mil gal	OCCURRING IN THE MONTH OF
Average	1.12	—	34.0	—
High	1.48	November	44.7	March
Low	.81	January	25.2	January

GENERAL

This project consists of a 0.83 mgd activated sludge sewage treatment plant with single stage digestion and liquid sludge disposal, designed to treat 1750 pounds of BOD per day. Also associated with the treatment plant are five sewage pumping stations.

The motors, pumps and electrical controls in the Day's Road pumping station were modified in order to cope with the high flows that are being received at this pumping station.

An additional blower was installed at the treatment plant, and the diffuser capacity was increased in order to treat hexamethyldiamine wastes from the Dupont Company of Canada plant. All the associated costs for equipment and modification to the plant to treat this waste were borne fully by Dupont.

Both sewage lift pumps at the plant were resleeved and the wear rings on the impellers were replaced.

All the shoes were replaced on the longitudinal primary and secondary sludge collectors. Water services were installed in the Airport Road and Day's Road pumping stations to facilitate cleaning.

An engineering design report prepared by R. V. Anderson Limited regarding sewage plant expansion was presented to and accepted by the Township of Kingston officials and the OWRC. A preliminary certificate of approval requesting an OWRC municipally financed project was completed. The extension to the sewage treatment facilities is presently being prepared by R. V. Anderson Limited.

EXPENDITURES

The total operating expenditure for the plant and associated pumping stations was $44,857.18. This was $157.18 above the budget of $44,700.00. The cost of treating 1,000,000 gallons of sewage was $109.86 or approximately seven cents per pound of BOD removed.

PLANT FLOWS and CHLORINATION

A total of 408 million gallons of sewage was treated. The average daily flow of 1.12 mgd exceeded the design capacity of the plant 84% of the time. The overload condition is due to increased development. The pumping stations and treatment plant facilities were all severely overloaded during rainstorms and spring runoff due to storm water connections to the sanitary sewers.

Chlorination of the final effluent was practised from April 15 to October 25. An average chlorine dosage of 2.8 milligrams per litre was required to obtain a 0.5 mg/l chlorine residual after a 15 minute contact period.

PLANT EFFICIENCY

The average concentrations of BOD and suspended solids in the plant influent were 216 and 383 mg/l respectively, a large decrease from the 1969 averages. The reduction in the strength of the raw sewage is due to the fact that septic tank contents are no longer being dumped into domestic sewers. Since this practice has been discontinued, the organic loadings on the plant process and digester have been reduced resulting in fewer odours, much less scum and a reduction of sludge bulking in the final tanks.

The average concentrations of BOD and suspended solids in the plant effluent were 23 and 22 mg/l respectively. This represented a reduction in BOD and suspended solids of 80% and 84% respectively. Although this represented a considerable improvement over 1969 results these values still exceeded the OWRC objectives.

SLUDGE

A total of 950,000 gallons of raw sludge with an average concentration of 40% solids was pumped to the digester. Approximately 1,142 cubic yards of digested sludge with a solids content of 4.4% was disposed of by tank truck haulage and 540 cubic yards of digested sludge was applied to the sludge drying beds.

CONCLUSIONS

Although the plant was both hydraulically and organically overloaded in 1970, the hydraulic overloading is by far the most critical problem. Although R. V. Anderson and Associates Limited are presently preparing a design to increase the capacity of the plant to 2.0 mgd every effort should be made to reduce the amount of storm water gaining access to the sanitary sewers.

The operation of the plant has improved considerably since the disposal of septic tank wastes into the sanitary sewers has been discontinued.

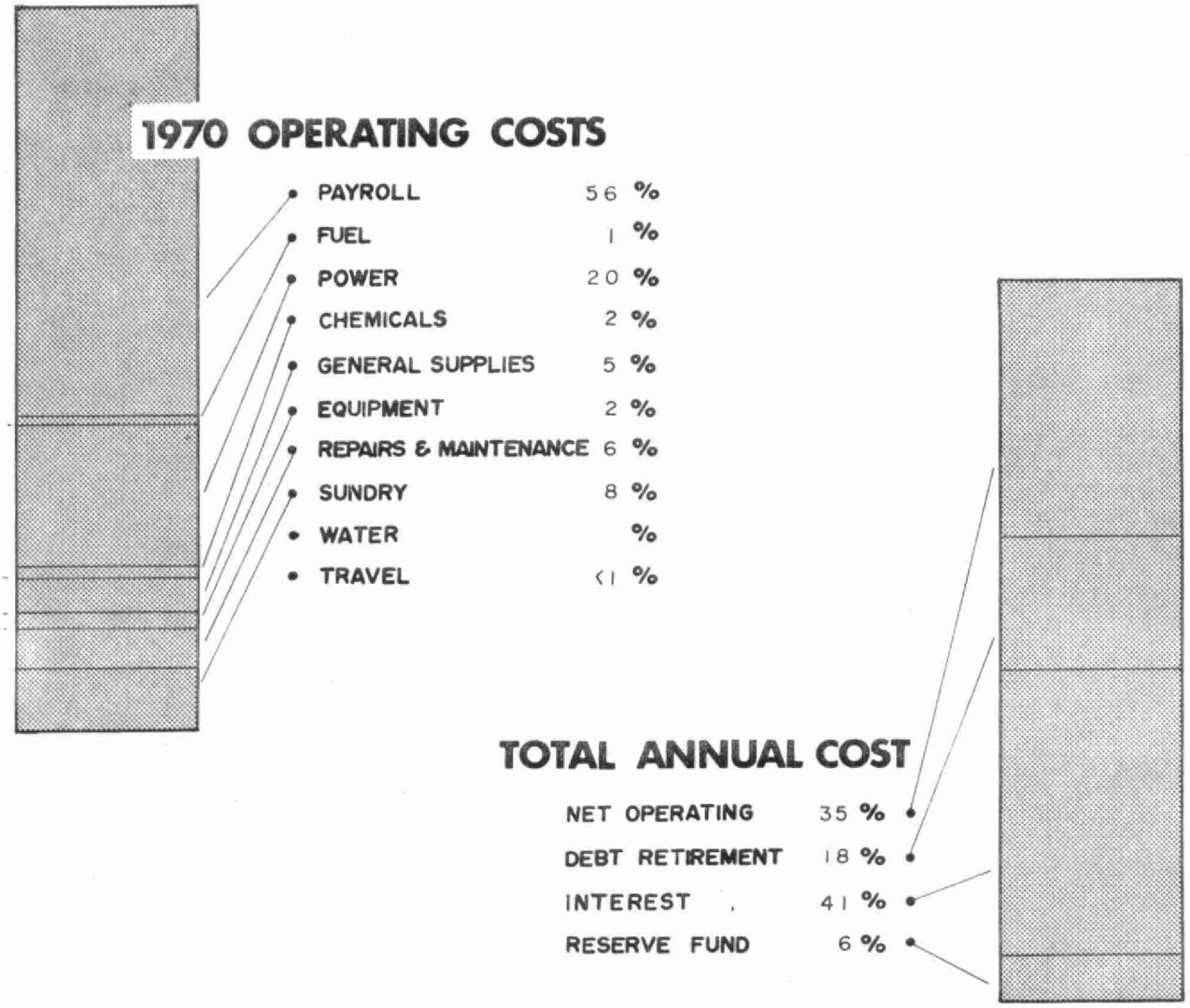
Hexamethyldiamine wastes from the Dupont Company of Canada were successfully treated at the plant after considerable treatability studies were conducted by the company and the Ontario Water Resources Commission, and modifications completed to substantially increase the air supply to the aeration section.

PROJECT COSTS

NET CAPITAL COST (Final)	$1,531,682.15
DEDUCT - Portion financed by CMHC/MDLB (Final)	588,503.56
Long Term Debt to OWRC	$ 941,178.59
Debt Retirement Balance at Credit (Sinking Fund) December 31, 1970	$ 77,236.25
Net Operating	$ 44,857.18
Debt Retirement	23,636.00
Reserve	8,207.49
Interest Charged	52,842.72
TOTAL	$ 129,543.39

RESERVE ACCOUNT

Balance @ January 1, 1970	$ 49,859.15
Deposited by Municipality	8,207.49
Interest Earned	2,958.70
	$ 61,025.34
Less Expenditures	27,524.47
Balance @ December 31, 1970	$ 33,500.87



Yearly Operating Costs

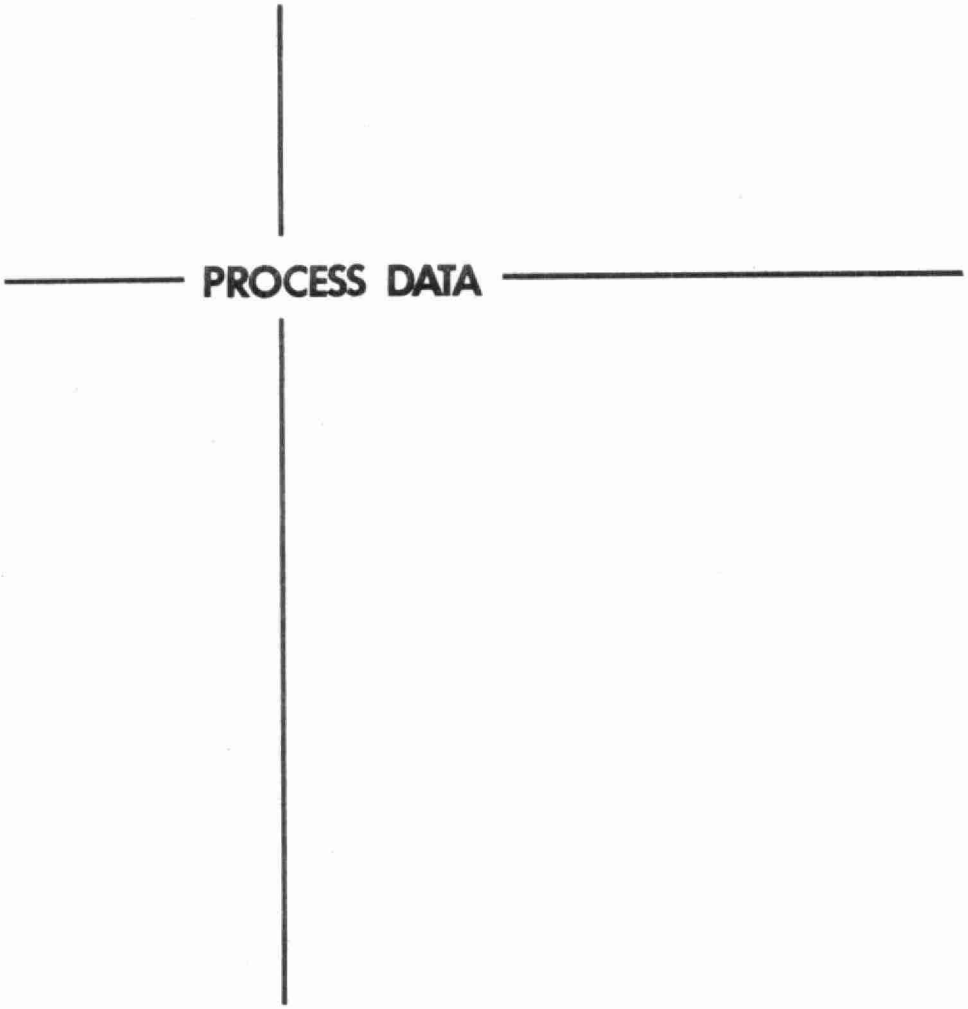
YEAR	MILLION GALLONS TREATED	TOTAL OPERATING COSTS	COST PER MILLION GAL	COST PER LB OF BOD REMOVED
1966	186.699	$25,674.25	$137.52	7 cents
1967	258.570	30,775.98	119.02	4 cents
1968	314.02	36,455.90	116.09	2 cents
1969	345.0	39,254.02	113.78	3 cents
1970	408.3	44,857.18	109.90	7 cents

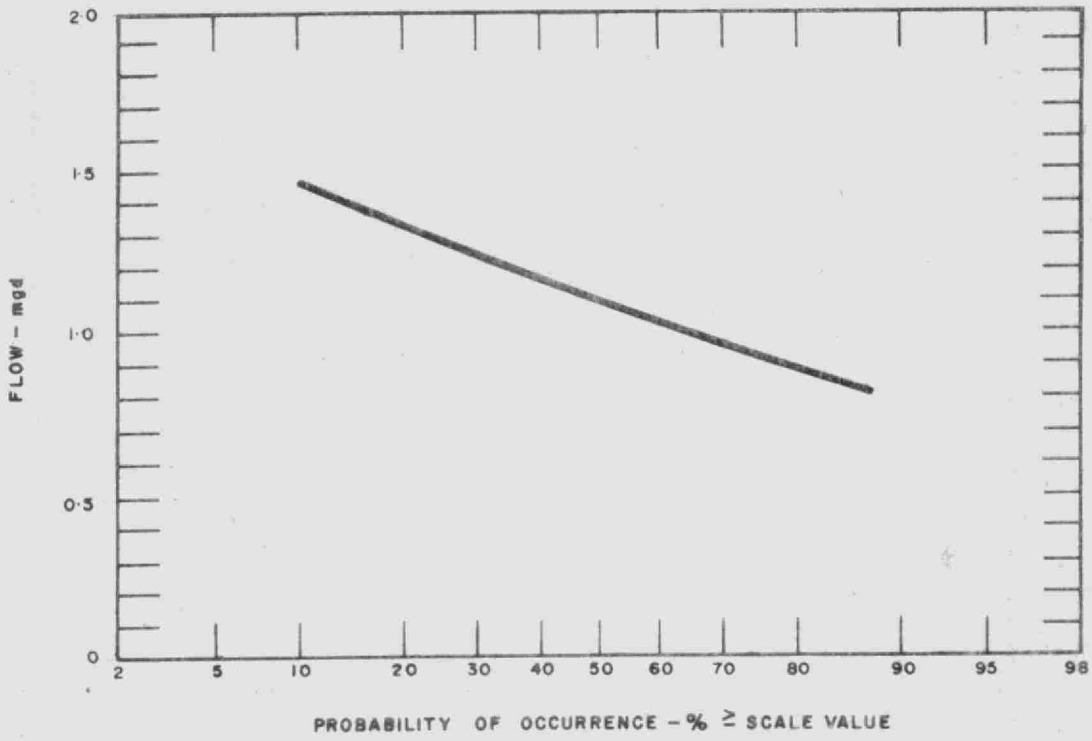
MONTHLY OPERATING COSTS

MONTH	TOTAL EXPENDITURE	PAYROLL	CASUAL PAYROLL	FUEL	POWER	CHEMICALS	GENERAL SUPPLIES	EQUIPMENT	REPAIRS and MAINTENANCE	SUNDRY *	WATER	TRAVEL
JAN	3063.44	2642.38	-	-	-	-	280.26	-	97.13	43.67	-	-
FEB	3771.10	1878.64	-	60.59	1357.75	-	180.47	-	192.38	101.27	-	-
MAR	3215.42	1851.75	-	76.50	728.60	-	129.62	-	277.38	151.57	-	-
APR	3160.35	1860.65	-	76.50	639.33	-	287.25	-	165.22	131.40	-	-
MAY	4001.72	2071.67	-	81.17	791.11	348.71	277.66	-	75.54	355.86	-	-
JUNE	2242.62	1950.19	-	-	-	-	32.81	-	24.00	134.42	-	101.20
JULY	3857.09	1798.50	277.08	-	874.71	348.71	162.93	-	93.81	301.35	-	-
AUG	4694.88	2705.37	340.79	-	997.08	-	130.57	-	190.50	339.57	-	(9.00)
SEPT	4978.33	1827.72	106.95	-	1398.38	348.70	215.60	-	283.40	797.58	-	-
OCT	3337.73	1822.60	-	55.60	412.69	-	288.47	-	360.14	297.68	-	100.55
NOV	3038.28	2089.35	-	-	-	-	48.21	148.88	299.30	452.54	-	-
DEC	5496.22	1845.23	-	196.63	1584.91	-	355.53	607.00	483.17	331.35	-	92.40
TOTAL	44857.18	24344.05	724.82	546.99	8784.56	1046.12	2389.38	755.88	2541.97	3438.26	-	285.15

BRACKETS INDICATE CREDIT

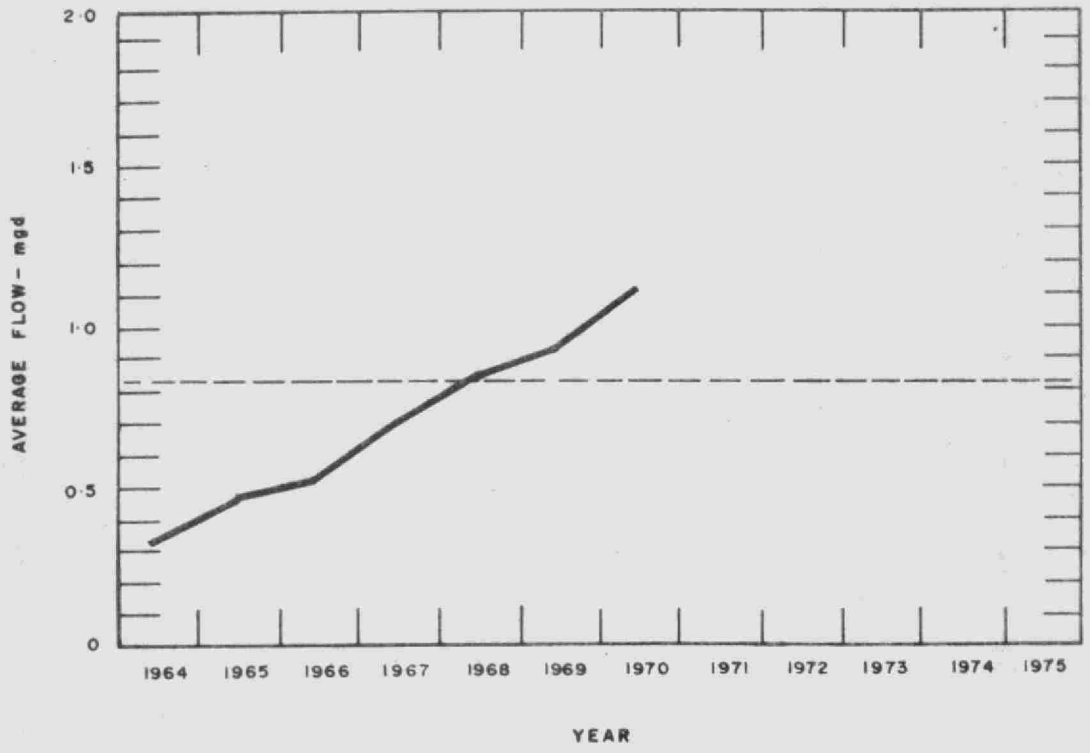
* SUNDRY INCLUDES SLUDGE HAULAGE COSTS WHICH WERE $1,178.00


PROCESS DATA



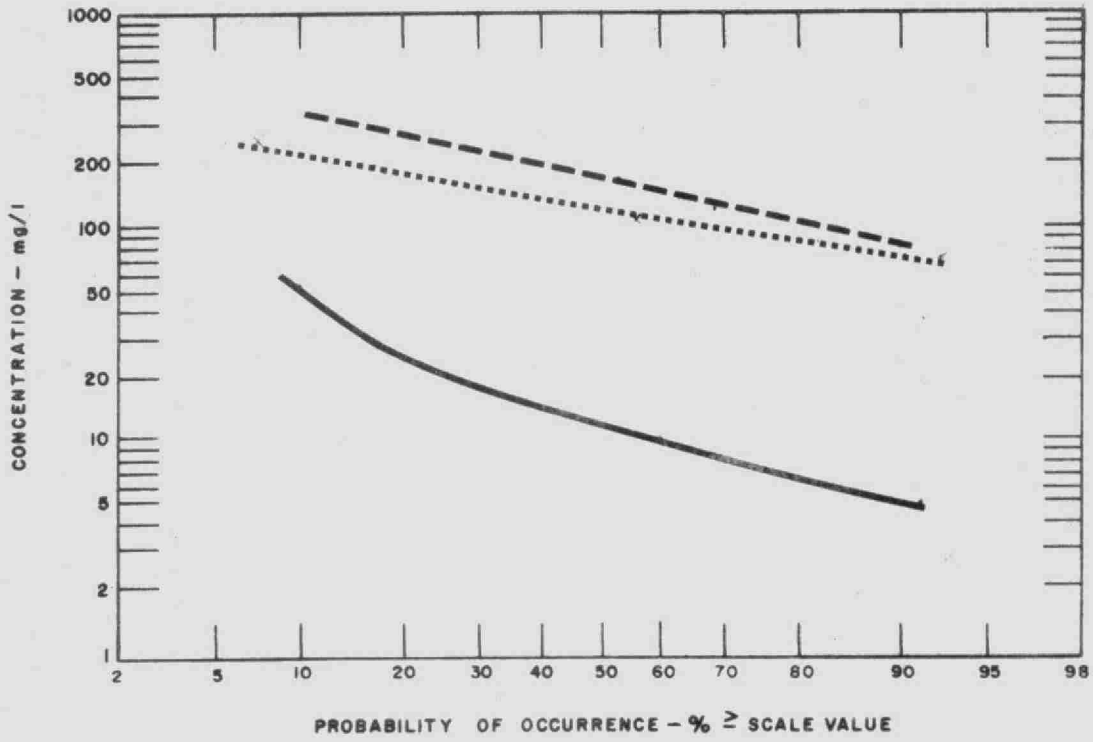
FLOWS

NOMINAL CAPACITY ——— ——— ———

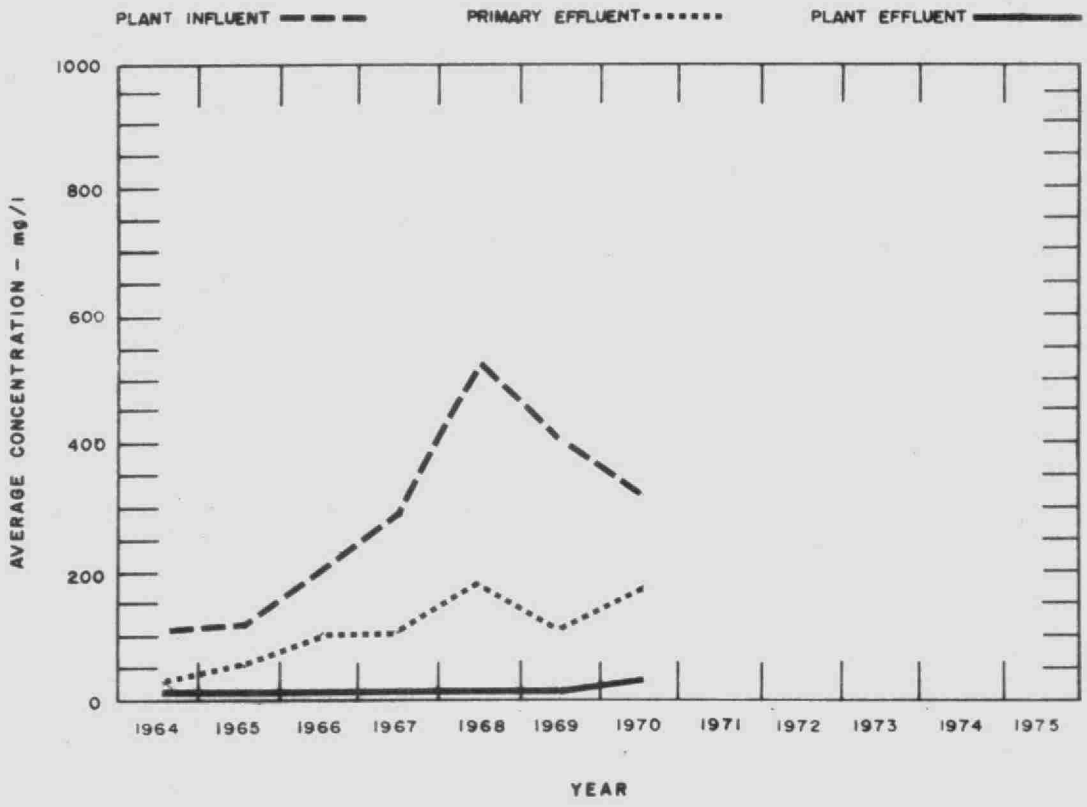


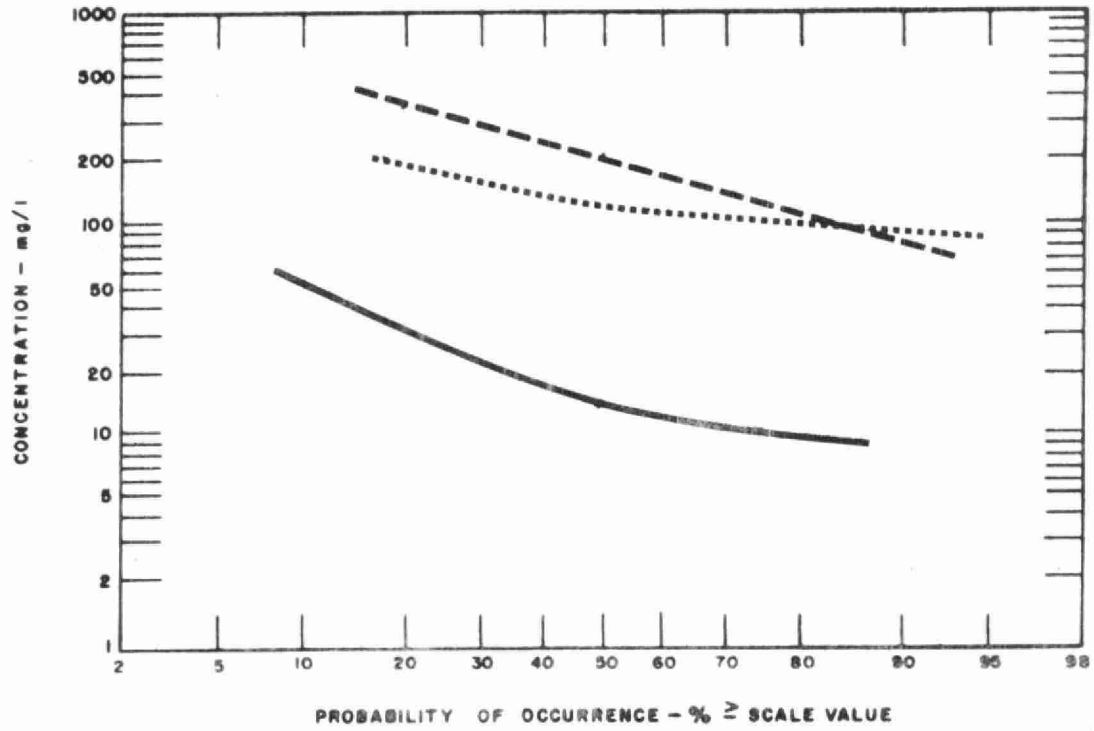
PLANT FLOWS and CHLORINATION

MONTH	TOTAL FLOW mil gal	AVERAGE DAILY FLOW mil gal	MAXIMUM DAILY FLOW mil gal	MINIMUM DAILY FLOW mil gal	CHLORINE USED pounds	DOSAGE mg/l
JAN	25.2	.81	.9	.7	-	-
FEB	28.9	1.04	1.6	.8	-	-
MAR	44.7	1.44	2.2	.9	-	-
APR	37.4	1.24	2.0	.9	600	1.6
MAY	29.2	1.04	1.1	.8	920	3.2
JUNE	27.7	.88	1.2	.8	890	3.3
JULY	35.1	1.13	2.1	1.1	920	2.6
AUG	28.9	.93	1.1	.8	830	2.9
SEPT	30.1	1.00	1.6	.8	650	2.1
OCT	40.0	1.29	2.0	1.0	590	1.5
NOV	44.2	1.48	2.1	.9	-	-
DEC	37.4	1.20	2.1	.9	-	-
TOTAL	408.3	-	-	-	5400	-
AVERAGE	-	1.12	2.2	.7	771	2.8

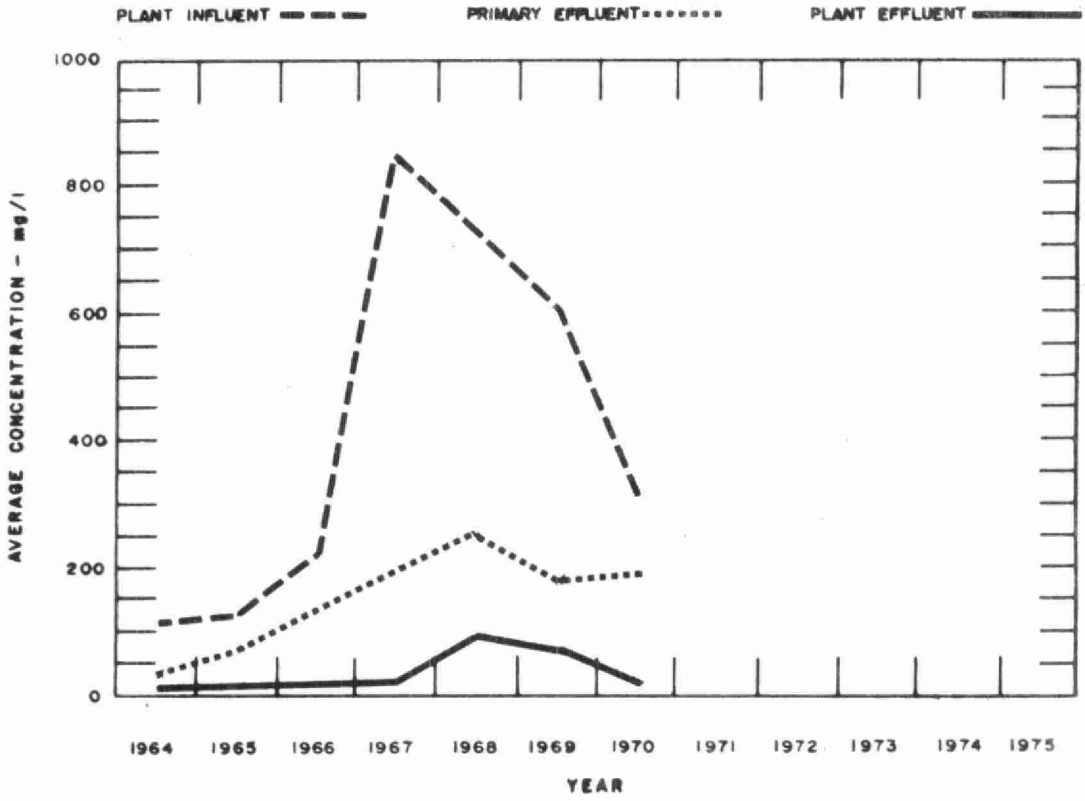


BIOCHEMICAL OXYGEN DEMAND





SUSPENDED SOLIDS



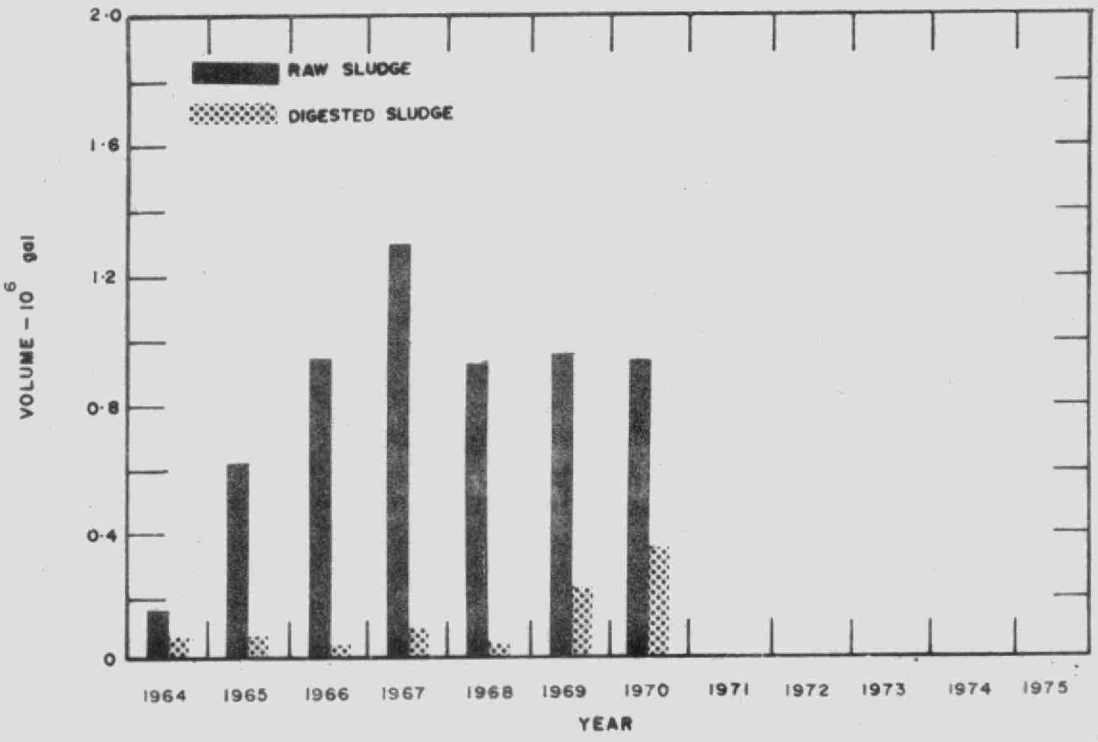
PLANT EFFICIENCY

MONTH	BIOCHEMICAL OXYGEN DEMAND						SUSPENDED SOLIDS						GRIT REMOVED
	INFLUENT		EFFLUENT		REDUCTION		INFLUENT		EFFLUENT		REDUCTION		
	n	mg/l	n	mg/l	%	10^3 pounds	n	mg/l	n	mg/l	%	10^3 pounds	cu ft
JAN	6	200	5	11	94	50	5	294	4	20	93	70	35
FEB	11	247	11	17	93	70	10	388	11	18	95	110	20
MAR	10	166	7	10	94	70	10	289	8	18	94	120	20
APR	10	72	11	19	74	20	12	109	12	14	83	30	25
MAY	7	271	1	4	99	80	7	505	2	12	98	140	20
JUNE	7	243	3	19	92	70	4	286	3	15	95	70	20
JULY	6	143	4	14	90	40	4	172	3	32	81	40	40
AUG	5	216	1	110	49	30	5	392	1	110	72	80	40
SEPT	7	450	3	50	89	120	4	691	3	12	98	200	20
OCT	3	223	1	9	96	60	1	165	1	10	94	60	50
NOV	3	163	1	60	63	40	1	110	1	50	55	30	12
DEC	1	250	1	167	33	30	3	358	1	138	47	40	40
TOTAL	76	-	49	-	-	680	66	-	50	-	-	990	342
AVERAGE	-	216		23	80	-	-	313	-	22	84	-	-

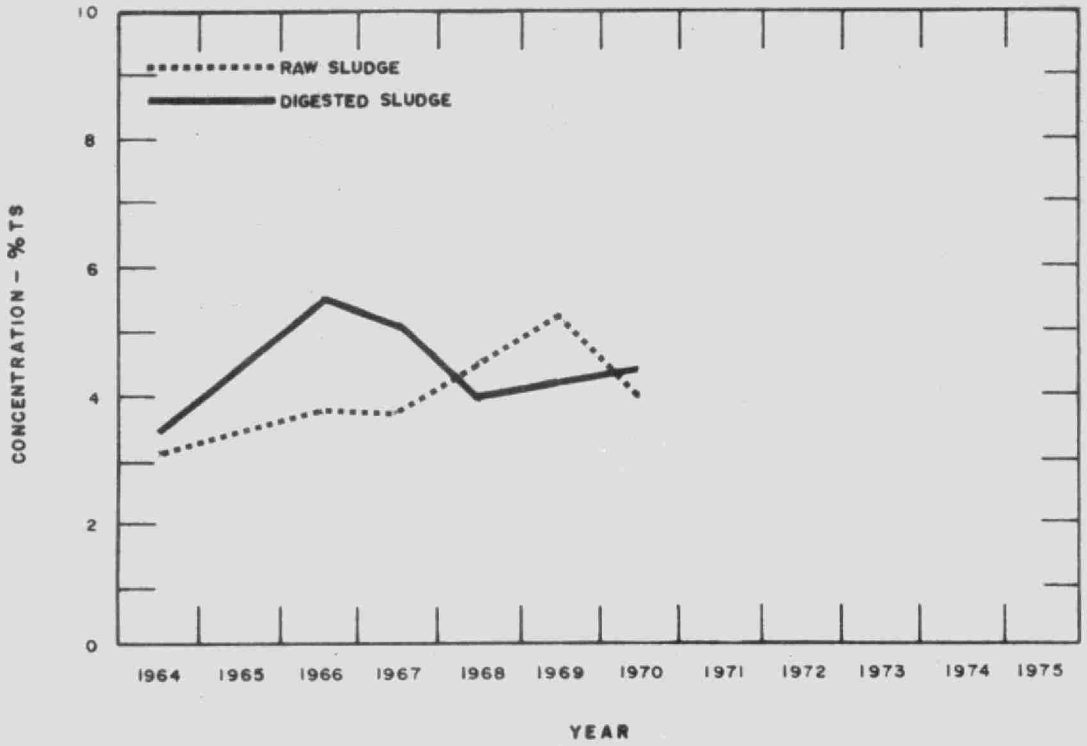
NOTE – n is the number of samples taken

AERATION

MONTH	AVG DAILY FLOW mil gal	AERATION INF. BOD mg/l	AERATION INF. SS CONCN mg/l	SECONDY. EFF. BOD mg/l	SECONDY. EFF. SS CONCN mg/l	M L S S CONCN mg/l	F/M lb BOD / lb MLSS	AIR USED 1000 cu ft / lb BOD	WASTE SLUDGE lb/DAY
JAN	.8	165	174	11	20	950	.53	1.1	290
FEB	1.0	99	113	17	18	1400	.28	1.6	250
MAR	1.4	146	542	10	18	1940	.41	6.7	370
APR	1.2	102	91	19	14	2200	.22	12.6	470
MAY	1.0	614	678	4	12	1720	.32	8.8	670
JUNE	.9	167	95	19	15	1670	.35	9.4	280
JULY	1.1	-	-	20	26	1690	-	-	130
AUG	.9	95	120	18	5	2110	.16	-	-
SEPT	1.1	155	100	50	12	1360	.46	1.5	-
OCT	1.3	90	60	-	-	1240	.36	1.2	-
NOV	1.4	93	80	20	-	1660	.30	1.2	100
DEC	1.2	-	112	-	52	1500	-	-	180
TOTAL	-	-	-	-	-	-	-	-	-
AVERAGE	1.1	173	197	19	19	1620	.34	4.9	300


RAW SLUDGE
DIGESTED SLUDGE
VOLUME - 10^6 gal
2·0
1·6
1·2
0·8
0·4
0
1964
1965
1966
1967
1968
1969
1970
1971
1972
1973
1974
1975
YEAR

DIGESTION


RAW SLUDGE
DIGESTED SLUDGE
CONCENTRATION - % TS
10
8
6
4
2
0
1964
1965
1966
1967
1968
1969
1970
1971
1972
1973
1974
1975
YEAR

SLUDGE DIGESTION and DISPOSAL

MONTH	RAW SLUDGE			DIGESTED SLUDGE			SUPERNATANT		SLUDGE DISPOSAL	
	VOLUME 10^3 gal	TOTAL SOLIDS %	VOL SOLIDS %	VOLUME 10^3 gal	TOTAL SOLIDS %	VOL SOLIDS %	VOLUME 10^3 gal	TOTAL SOLIDS %	DEWATERED cu yd	LIQUID cu yd
JAN	70	3.7	77	10	-	-	50	2.3	-	71
FEB	70	4.7	-	30	4.2	-	20	.4	-	183
MAR	80	4.2	-	20	6.0	-	40	.3	-	118
APR	70	3.7	71	10	5.5	-	20	.4	-	59
MAY	90	3.7	72	60	4.7	50	40	.2	-	284
JUNE	90	-	-	20	-	-	30	-	-	142
JULY	90	-	-	10	-	-	70	-	-	47
AUG	90	-	-	40	1.5	-	40	-	-	213
SEPT	80	-	-	40	-	-	300	-	-	238
OCT	70	-	-	20	-	-	120	-	-	142
NOV	70	-	-	30	-	-	30	-	-	165
DEC	80	-	-	-	-	-	80	-	-	-
TOTAL	950	-	-	290	-	-	840	-	-	1662
AVERAGE	-	4.0	73	-	4.4	50	840	.7	-	-

Water management in Ontario